PATENT APPLICATION

DOOR HANDLE ASSEMBLY

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[01] DOOR HANDLE ASSEMBLY

[02] Cross Reference to Related Applications

[03] This application is a continuation of U.S. application number 10/213,135, filed August 5, 2002. That application claims the benefit of and incorporates by reference, U.S. provisional application number 60/318,478, filed on September 10, 2001.

[04] Field of the Invention

[05] The present invention relates to door handle assemblies. More particularly, the present invention relates to low-profile door handle assemblies having door handles actuated by a non-rotational motion.

[06] Background

[07] Conventional door handle assemblies typically include a pair of faceplates, a slide bolt, and a pair of door handles. The slide bolt is assembled inside a standard bore of a door so that when the slide bolt extends, it engages the door to an aperture in a wall thereby closing the door and allowing the door to be locked. The standard bore is covered by two opposing faceplates. The door handles protrude from the faceplates.

[08] The height of a conventional door handle is typically 2.25 to 2.50 inches, as measured from a door surface. A conventional door often damages a wall, especially when a door is

slammed into a wall. A wall can also be gradually damaged when a conventional door handle often contacts the wall. To minimize wall damage, people use devices, such as doorstops and rubber pads attached to the walls. However, doorstops and rubber pads are not aesthetically pleasing to some people. Doorstops and rubber pads also require additional cost, time, and effort to install. Additionally, doorstops and rubber pads leave permanent marks or holes on the wall when removed. Thus, a door handle that does not cause wall damage is desired.

[09] Another problem with a conventional door handle assembly is it requires rotation of the handle to open a door. Rotating a door handle is difficult at times, particularly when carrying an object with both hands, or particularly when the user is elderly, physically challenged, or has wrist problems. Thus, a door handle assembly that allows a user to open a door without having to rotate the door handle is also desired.

[10] A number of door handles and door handle assemblies are available. U.S. Patent number 2,260,74 ('74) discloses a low-profile handle assembly designed for automobiles. The handle assembly has a large disk-like plate. The front face of the disk-like plate is recessed and attaches a crossbar spanning across the recess. The crossbar has an offset projection at one of its ends to provide a finger piece for the handle assembly.

[11] A user would use the finger piece as a crank for raising and lowering the glass panels in windows. A user would also use the finger piece as a handhold or grip for use and assistance in closing the vehicle door. The problem with '74 is it only provides a handhold for opening or closing a door. The handhold does not actuate a lock or a slide bolt.

[12] U.S. Patent number 5,085,474 ('474) discloses a latch opener of the push-pull type. '474 has a base plate secured to a door. A handle is mounted on the base plate to pivot about a first axis. The handle is attached to an actuator. The actuator is mounted on the base plate to pivot about a second axis perpendicular to the first axis. The actuator includes a projecting arm

engageable in an opening of a latch bolt housing. When the arm engages a latch bolt, the arm causes the latch bolt to slide and thereby allowing the door to open. The latch bolt housing has a coil spring to continuously bias the latch bolt into a position protruding out of the door thereby allowing the door to close. The problem with '474 is that its handle protrudes in a manner that can cause wall damage. Additionally, its actuator is composed of multiple parts, which makes the actuator susceptible to mechanical malfunction and which makes the actuator expensive to manufacture.

[13] Advantages of One or More Embodiments of the Present Invention

[14] The various embodiments of the present invention may, but do not necessarily, achieve one or more of the following advantages:

[15] provide a low-profile door handle;

[16] provide a door handle substantially flush with a faceplate cover;

[17] provide an attractive door handle;

[18] provide a door handle assembly that opens a door by a non-rotational motion;

[19] provide a door handle assembly that allows a user to open a door easily;

[20] provide a bolt constructed with unitary piece of material;

[21] provide a bolt constructed with minimum machining;

[22] provide a bolt that makes a sturdy and secure door lock;

[23] provide a door handle assembly that is easy to install;

[24] provide a door lock with an emergency access;

[25] provide a door handle assembly with minimal components;

[26] the ability to minimize wall damage from a door handle;

[27] prove a door handle that may be operated with minimal force; and

[28] provide a door handle that can be easily pushed to open a door.

[29] These and other advantages may be realized by reference to the remaining portions of the specification, claims, and abstract.

[30] Brief Summary of the Aspects of the Invention

In at least one embodiment, a door handle assembly is provided comprising a door handle having a roller and attached to a mount. An actuator is attached to the mount and has a first surface and an actuator projection. The door handle assembly also comprises a bolt moveable from a first bolt position where at least a portion of the bolt is inside a wall aperture, thereby engaging the door into the wall aperture, to a second bolt position where the portion of the bolt is outside the wall aperture, thereby disengaging the door from the wall aperture. The bolt has an actuator opening, the actuator passing therethrough. The roller buts the first surface and may travel from a first roller position to a second roller position when the door handle is pushed, thereby retracting the bolt from the first bolt position to the second bolt position.

[31] Some of the embodiments of the present invention may not include all of the features or characteristics listed in the above summary. There are, of course, additional features of the invention that will be described below and will form the subject matter of claims. In this respect, before explaining at least one preferred embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of the construction and to the arrangement of the components set forth in the following description or as illustrated in the drawings. The invention is capable of other embodiments and of being practiced and carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting.

[32] Brief Description of the Drawings

[33] Certain embodiments of the invention are shown in the following drawings where:

[34] Figure 1 is substantially a top plan view of one embodiment of the door handle assembly of the present invention being attached to a door, the door handle assembly having a handle and a faceplate cap on each side of the door, and the handle and the faceplate cap on each side of the door defining a substantially flush and a substantially flat surface.

[35] Figure 2 is substantially an exploded view of one embodiment of the door handle assembly of the present invention.

[36] Figure 3 is substantially an elevational view of one embodiment of a faceplate of the present invention.

[37] Figure 4 is substantially a side view of the embodiment of the faceplate shown in figure 3.

[38] Figure 5 is substantially a plan view of the front side of the faceplate embodiment shown in figure 3.

[39] Figure 6 is substantially a plan view of the backside of the faceplate embodiment shown in figure 3.

[40] Figure 7 is substantially a plan view of the front side of another faceplate embodiment.

[41] Figure 8 is substantially a plan view of the backside of the faceplate embodiment shown in figure 7.

[42] Figure 9 is substantially a side view of an embodiment of a faceplate cap of the present invention.

[43] Figure 10 is substantially a plan view of the faceplate cap embodiment shown in figure 9.

[44] Figure 11 is substantially a cross-sectional view of the faceplate cap embodiment shown in figure 9 with the front side being on the bottom and the backside being on top.

[45] Figure 12 is substantially a perspective view of an embodiment of a door handle and an actuator of the present invention.

[46] Figure 13 is substantially a perspective view of an embodiment of a bolt of the present invention.

[47] Figure 14 is substantially a perspective view of an embodiment of a bolt housing of the present invention.

[48] Figure 15 shows substantially one method of opening a door or disengaging a door from a wall, wherein a handle actuates an actuator and the actuator engages a bolt to slide the bolt away from a wall aperture.

[49] Figure 16 is substantially a perspective view of an embodiment of a cam of the present invention, the cam being attached to a cam shaft, the cam shaft having a depression to receive a cam actuator, and the cam shaft further having a cam rotation stop to limit the rotation of the cam.

[50] Figure 17 is substantially an embodiment of a locking mechanism of the present invention, wherein the cam shown in figure 16 is in a locked position and the bolt may slide away from the wall aperture to allow the door to open.

[51] Figure 18 is substantially the locking mechanism embodiment shown in figure 17, wherein the cam is in an unlocked position, and the cam prevents the bolt from sliding away from the wall aperture thereby preventing the door from being opened.

[52] Figure 19 is substantially an embodiment of the door handle assembly wherein the door may only be opened by using the door handle positioned only on one side of the door.

[53] Figure 20 is substantially another embodiment of the door handle assembly wherein the door may be opened by using the door handles positioned on both sides of the door.

[54] Figure 21 is substantially another embodiment of the door handle assembly, wherein the door may only be opened by using the door handle positioned only on one side of the door, wherein the door may be locked and unlocked using the cam latch positioned on the same side of the door as the door handle, and wherein the door may be locked and unlocked by actuating cam through an alternate cam access.

[55] Figure 22 is substantially another embodiment of the door handle assembly, wherein the door may only be opened by using the door handle positioned only on one side of the door, and wherein the door may be locked and unlocked using the cam latch positioned on the same side of the door as the door handle.

[56] Figure 23 is substantially another embodiment of the door handle assembly, wherein the door may only be opened by using the door handle positioned only on a first side of the door, wherein the door may be locked and unlocked using the cam latch positioned on the same side of the door as the door handle, and wherein the door may be locked and unlocked by using a key from a second side of the door.

[57] Figure 24 is substantially perspective view of a door having an embodiment of the door handle assembly attached, the perspective view also showing the low-profile characteristic and non-rotational actuation feature of the door handle.

[58] Figure 25 shows a comparison between the dimensions, including the angles measured from a door surface, of the preferred embodiment of the door handle assembly and the conventional door handle assemblies.

[59] Figure 26 is substantially a top view of an alternative, push operated door handle assembly according to the present invention.

[60] Figure 27 is substantially a top view of the door handle assembly of figure 26 wherein the door handle has been pushed.

[61] Description of the Preferred Embodiments

[62] In the following detailed description of the preferred embodiments, reference is made to the accompanying drawings, which form a part of this application. The drawings show, by way of illustration, specific embodiments in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

[63] The present invention comprises a door handle assembly, generally indicated by reference number 20. Referring to figure 1, door handle assembly 20 is preferably configured to attach to a door 22. Door 22 is engageable to a wall recess 24 preferably covered by a striker plate 26. Door 22 has a front side 28 and a backside 30. Front side 28 is preferably distinguishable from backside 30 by front side 30 being the side to which striker plate 26 protrudes.

[64] In the preferred embodiment, door handle assembly 20 has a pair of opposing faceplates 32 and 34, a pair of opposing faceplate caps 36 and 38 attached to their corresponding faceplates, and a pair of opposing handles 40 and 42. Faceplate cap 36 and handle 40 define a substantially flush and flat surface 44 on front side 28. Faceplate cap 38 and handle 42 define a substantially flush and flat surface 46 on backside 30. In the most preferred embodiment, door handle assembly 20 also has a cam handle 48.

[65] Referring now to figure 2, the preferred embodiment of door handle assembly 20 has an actuator 50 attached to handle 42 and an actuator 52 attached to handle 40. Each actuator 50 and 52 preferably has a pin passage 55 adjacent to its corresponding handle. A fastener (not shown) known in the art may be used to pivotably or rotatably attach actuators 50 and 52 to their corresponding actuator mount 56 and 57.

[66] Actuator mounts 56 and 57 are preferably similar, and they are preferably made of two

opposing and parallel projections 59 and 61 being spaced apart. Each actuator mount 56 and 57 preferably has a fastener opening 62 defined by their projections 59 and 61, preferably at the ends of each projections 59 and 61. To attach actuators 50 and 52 to their actuator mounts 56 and 57, respectively, each actuator 50 and 52 is placed in between the parallel projections 59 and 61 of their corresponding actuator mount 56 and 57. A fastener (not shown in figure 1) is inserted through fastener opening 61, fastener passage 55, and fastener opening 62.

[67] The ends of parallel projections 59 and 61 of each actuator mounts 56 and 57 that are distal from fastener opening 62 are attached perpendicular to faceplates 32 and 34. Faceplates 32 and 34 are attachable to each other through parallel posts 58 and 60. Faceplate caps 66 and 68 are attached to faceplates 32 and 34, respectively.

[68] Door handle assembly 20 may further have a bolt 70. Bolt 70 is preferably configured to be positioned inside a bolt collar 72. Bolt collar 72 and bolt 70 are preferably configured to be positioned inside a bolt housing 74. Bolt 70 preferably has a bolt ring 76. A first biasing device 78, preferably a spring, may be positioned in between bolt ring 76 and bolt collar 72. Bolt collar 72 is preferably configured to attach to a bolt plate 80 by using fasteners known in the art, such as a screw. A second biasing device 82, preferably a spring, may be positioned in between bolt ring 76 and bolt plate 80. Biasing devices 78 and 80 may also be made of other materials known in the art, such as a coil spring or a tension spring.

[69] Door handle assembly 20 may further have a cam 84 configured to extend across and perpendicular to the planes of faceplates 32 and 34. Cam 84 is further configured to be positioned inside bolt housing 74 and perpendicular to the sliding axis of bolt 70.

[70] FACEPLATES

[71] Faceplates 32 and 34 are preferably made of zinc metal, but may be made of other

materials known in the art such as brass, zinc alloy, or steel. An embodiment of one of the faceplates of door handle assembly 20 is shown in figures 3-6. Faceplate 32 is preferably configured to attach to front side 28 of door 22 (shown in figure 1). Referring now to figure 3, faceplate 32 has a front side 122 and a backside 124. Front side 122 forms the exterior side of faceplate 32, which is the visible side when faceplate 32 is attached to a door. An actuator mount 56 is attached to front side 122 of faceplate 32. Actuator mount 56 preferably has two parallel projections 59 and 61. Backside 124 forms the interior side of faceplate 32, which will not be visible when faceplate 32 is attached to a door. Faceplate 32 has two parallel posts 58 and 60 attached to backside 55. The ends of posts 58 and 60 that are not directly attached to backside 124 preferably have hollow ends, which may further have threaded interiors to accommodate threaded screws for attaching an opposing faceplate.

[72] Referring now to figure 4, actuator mount 56 preferably defines a fastener passage 62. Fastener passage 62 allows a pin or a fastener known in the art to attach an actuator to actuator mount 56. As shown also in figure 4, backside 124 preferably has three concentric layers 126, 128, and 130. Referring now to figure 5, front side 122 has a circular cam opening 132 preferably substantially in the middle of front side 122. Circular cam opening 132 allows cam (not shown in figure 5) to attach to faceplate 32.

[73] Front side 122 further has an oblong actuator passage 134. Actuator passage 134 is positioned between parallel projections 59 and 61. Of course, the positions, shapes, and sizes of actuator passage 134 and cam opening 132 may vary. Referring now to figure 6, actuator passage 134 preferably extends through layer 128. Posts 58 and 60 are preferably attached on layer 128.

[74] Another embodiment of faceplate is shown in figures 7-10. Faceplate 34 is preferably configured to attach to back side 30 of door 22 (shown in figure 1). Faceplate 34 is preferably

similar to faceplate 32 (shown in figures 3-6). However, faceplate 34 preferably does not have posts attached to the backside of the faceplate unlike faceplate 32. Referring to figure 7, faceplate 34 preferably has fastener openings 140 and 142 drilled on backside 124 so that when faceplates 32 and 34 are attached to a door, opposing faceplates 32 and 34 are connected by fasteners, such as screws, through fastener openings 140 and 142 of faceplate 34 and posts 58 and 60 of faceplate 32.

[75] Referring now to figure 8, faceplate 34 also has three concentric layers like faceplate 32. However, in the preferred embodiment, faceplate 34 has an additional fourth layer 146. Fourth layer 146 preferably defines cam stops 148 and 150, and thus fourth layer 146 is preferably circular shaped having a larger radius on one side than the other. Fourth layer 146 preferably further defines a cam opening 152. Cam opening 152 is configured to receive cam 105 (not shown in figure 8). When cam 105 (not shown in figure 8) attaches to fourth layer 146 through cam opening 152 and rotates, the axis of rotation of cam 105 will be limited by cam stops 148 and 150.

[76] FACEPLATE CAPS

[77] Referring now to figure 9, an embodiment of a faceplate cap 66 is shown. Faceplate caps 66 and 68 (shown in figure 1) are preferably similar. Faceplate cap 66 is preferably made of zinc metal, but may be made of other materials known in the art, such as brass, zinc alloy, or steel. Faceplate cap 66 has preferably a hemisphere shape further cut crosswise by a half. Faceplate cap 66 has a backside 154 and a front side 156. The preferred distance from backside 154 and front side 156 is equal to or less than 1 inch. When measured from a door surface 155, the preferred height of faceplate cap 66 is equal to or less than 1 inch. Of course, the faceplate cap may be made with varying dimensions.

[78] As shown in figure 10, backside 154 preferably has flat base 158 configured to attach to a faceplate (not shown in figure 10). Flat base 158 preferably has three openings 160, 162, and 164 for fasteners, such as screws, to attach faceplate cap 66 to a faceplate (not shown in figure 10). Of course, flat base 158 may be attached to a faceplate by welding, by using an adhesive, or other techniques known in the art. Front side 156 preferably defines a semi-circular recess 166, which accommodates handle 40 or 42 (not shown in figure 10). Front side 156 and handle 40 or 42 forms a substantially flat surface (not shown in figure 10).

[79] Faceplate cap 66 may be made of shapes other than a hemisphere that is further cut by a half. Faceplate cap 66 may be in the shape of an entire hemisphere, a hemisphere cut by more than or less than a half, or some portion of a sphere cut crosswise by exactly a half, more than a half, or less than a half.

[80] As shown in figure 11, when faceplate cap 66 is laid on a flat surface with front side 58 on the bottom and backside 56 on top, the edges of front side 58 forms substantially an acute angle measured from the flat surface.

[81] DOOR HANDLES AND ACTUATOR

[82] Referring now to figure 12, a handle 40 with an attached actuator 52 is shown. Handle 42 shown in figure 2 is preferably similar to handle 40. Actuator 52 shown in figure 2 is preferably similar to actuator 50. Handle 40 has a front surface (not shown in figure 12) and a back surface 168. Handle 40 preferably has a semi-circular shaped half 41. The other half of handle 40 is preferably a substantially c-shaped half 43, wherein the ends of the "c" are smoothly connected to semi-circular shaped half 41. C-shaped half 43 allows a user to easily grasp and pull handle 40.

[83] Semi-circular shaped half 41 preferably has raised edges 170 to add more definition to

handle 40. Handle 40 preferably has a pivot stop 172 attached in the middle of raised edge 170 of semi-circular shaped half 41 and adjacent to back surface 168. Pivot stop 172 may be made of various shapes. Pivot stop 172 preferably protrudes from raised edge 170 and is preferably parallel to the plane of raised edge 170. Pivot stop 172 restricts the pivot movement of handle 40.

[84] When handle 40 is attached on actuator mount 56 (not shown in figure 12) and adjacent to faceplate cap 66 (not shown in figure 12), handle 40 and faceplate cap 66 are preferably configured to form a substantially flush and substantially flat front surface.

[85] Actuator 52 is preferably attached on backside 168 of handle 40 and perpendicular to handle 40. Actuator 52 is preferably positioned adjacent to the middle of the rounded edge of semi-circular half 41 of handle 40. Actuator 52 preferably defines pin passage 55 adjacent to the end of actuator 52 that is adjacent to handle 40. The opposite end of actuator 52 that is away from handle 40 is preferably tapered on one side to allow for better positioning of actuator 52 inside actuator passage of bolt 70 (not shown in figure 12).

[86] Handle 40 and actuator 52 are preferably made of zinc, but may be made with other materials known in the art, such as steel, zinc alloy, and brass. In the preferred embodiment, handle 40 and actuator 52 are unitarily built. However, handle 40 and actuator 52 may also be attached through welding or through an adhesive. Handle 40 and actuator 52 may further be attached using fasteners known in the art.

[87] BOLT

[88] Referring now to figure 13, a preferred embodiment of bolt 70 is shown. In the preferred embodiment, bolt 70 partially tapers toward a first end 200. First end 200 is configured to insert through a wall aperture to engage and close a door. First end 200 is tapered so that when first

end 200 is in contact with a striker plate surrounding a wall aperture (not shown in figure 13), first end 200 slides past striker plate, and first end 200 slides towards inside the wall aperture. First end 200 is also tapered to allow bolt 70 to move outside the wall aperture quicker when the door is opened.

[89] In the preferred embodiment, bolt 70 also has a pin opening 204. One end of a pin (not shown) may be inserted inside pin opening 204 and the other end of pin may be attached to a pin opening 71 of bolt collar 72 (shown in figure 2), and thus the pin prohibits substantial rotational movement of bolt 70. Prohibiting substantial rotational movement of bolt 70 may allow proper actuator positioning inside actuator opening 202, which translates to proper operation of actuators 52 and 50 (not shown in figure 13).

[90] In the preferred embodiment, bolt 70 has a ring 76. Ring 76 provides an abutting surface for biasing devices 78 and 82 (shown in figure 2) so that biasing devices 78 and 82 can operate to cause bolt 70 to slide back and forth in a sliding axis thereby allowing bolt to engage and disengage a door from a wall aperture. Bolt 70 has a second end 206, which is opposite first end 200. Bolt 70 defines a cam aperture 208 adjacent to the second end. Cam aperture 208 is configured to accommodate cam 105 (not shown in figure 13) positioned perpendicular to bolt 70. At the second end, bolt 70 has a plurality of fingers 210, 212, 214, and 216. Fingers 210, 212, 214, and 216 define a pair of stop surfaces 218 and 220 for a cam portion (not shown in figure 13) to abut to prevent bolt from sliding in its sliding axis.

[91] Bolt 70 is preferably made of zinc, but may also be made of materials known in the art, such as zinc alloy, steel, and brass. Bolt 70 is preferably unitarily constructed. Bolt 70 may unitarily be constructed by molding or other techniques known in the art. A unitarily constructed bolt 70 provides a sturdier and thus more secure lock than a bolt made of multiple components. A lock provided by a bolt made of multiple components may easily be tampered. For example,

if one component gives in to the tampering or if the component bends or breaks, the remaining components may lose the support provided by the component that gave in. In contrast, for a lock supported by a unitarily constructed bolt to be tampered, the entire bolt has to be destroyed. Since bolt 70 is usually positioned inside a standard bore of a door, tampering with bolt 70 may require destruction of the entire door.

[92] BOLT HOUSING

[93] Referring now to figure 14, an embodiment of a bolt housing is shown. Bolt housing 74 preferably defines post passages 222 and 224. Post passages 222 and 224 are designed to receive posts 58 and 60 of faceplate 32 (not shown in figure 14). Bolt housing 74 further defines a cam passage 226 in between post passages 222 and 224. Cam passage 226 is designed to allow cam 105 (not shown in figure 14) to extend between faceplates 32 and 34(also not shown in figure 14). Next, bolt housing 74 defines a bolt passage 228 to allow bolt 70 (not shown in figure 14) to pass through and meet with cam 105 (also not shown in figure 14). Bolt housing 74 further defines actuator slots 227 and 229 to allow actuators 50 and 52 (not shown in figure 14) to pass through and engage bolt 70 (not shown in figure 14).

[94] ACTUATION

[95] Referring now to figure 15, biasing device 78 preferably urge bolt 70 to a first position wherein bolt 70 is configured to protrude from a door 230 and to engage door 230 with a wall 232 by moving into wall aperture 234 surrounded by a striker plate 236. Door handle 42 is attached to actuator 50. Actuator 50 extends through actuator passage (not shown in figure 15) of faceplate 32 and through actuator opening 202 to engage bolt 70. Door handle 42 and actuator 50 are attached on actuator mount 56, which serves as a fulcrum allowing handle 42 and actuator

50 to pivot around a pivot axis.

[96] As a user opens door 230, the user holds handle 42 and pulls handle 42 toward him or her. Handle 42 and actuator 50 pivots around the fulcrum provided by actuator mount 56. Actuator 50 moves bolt 70 to a second position wherein bolt 70 moves outside wall aperture 234 thereby disengaging door 230 from wall 232. After the user releases door handle 42, biasing device 78 naturally urges bolt 70 to protrude from door 230 thereby causing door handle 42 to move to a position wherein door handle 42 and faceplate cap 66 defines a substantially flush and substantially flat front surface. Pivot stop 172 of door handle 42 abuts faceplate cap 66 to maintain a substantially flush and substantially flat front surface.

[97] CAM

[98] Referring now to figure 16, a preferred embodiment of cam 105 has a cam portion 240 attached to a camshaft 242. Cam portion 240 is preferably shaped to fit cam aperture 208 of bolt 70. Cam portion 240 preferably has a raised abutting portion 250 to abut stop surfaces 218 and 220 of bolt 70 (not shown in figure 16) and prevent bolt from sliding away from wall aperture thereby locking the door. Cam 105 further has a cam ring 246 and a ring projection 248 transverse from cam ring 246. Ring projection 248 preferably cam stops 148 and 150 (shown in figure 8) when cam 105 rotates around its axis of rotation to limit rotation of cam 105.

[99] In the most preferred embodiment, an alternate cam access 244 is positioned at one end of camshaft 242. Alternate cam access 244 is preferably a depression spanning crosswise across the end of camshaft. The depression is preferably sized to fit a flathead screwdriver or a key so that a flathead screwdriver or a key may be used as alternative devices to a cam latch (not shown in figure 16) to actuate cam 105.

[100] LOCKING MECHANISM

[101] Referring now to figure 17, a cam latch 256 may be attached to cam 105, which may allow a user to conveniently activate cam 105. By pivoting cam latch 256 within a rotational axis, cam latch 256 moves cam 105 between first and second positions discussed below. Cam latch 256 may be positioned on the side of faceplate 32 where actuator mount 56 (not shown in figure 17), faceplate cap 66, and door handle (not shown in figure 17) are attached for easy access by the user. Cam 105 may also have alternative cam access 244 to allow a user to use screwdrivers, keys, and the like to access cam from to move cam 105 between first and second positions discussed below.

[102] Cam 105 is preferably positioned perpendicular to bolt 70 and in between fingers 210, 212, 214, and 216 of bolt 70 (not shown in figure 17). Cam 105 is configured to be moveable to a first position where raised abutting portion 244 of cam 105 abuts stop surfaces 218 and 220 of bolt 70 (only one stop surface is shown in figure 18) thereby preventing bolt 70 from sliding away from a wall aperture 252 and preventing a door 254 from opening.

[103] Referring now to figure 18, cam 105 may also be movable to a second position wherein raised abutting portion 244 of cam 105 does not abut stop surfaces 218 and 220 of bolt 70 thereby allowing bolt 70 to slide towards a second position wherein bolt 70 is away from wall aperture and thereby allowing door 254 to open.

[104] CLOSET DOOR ASSEMBLIES

[105] Referring now to figure 19, a door handle assembly of an alternative embodiment is shown. The door handle assembly shown in figure 19 may be suited for doors that need not be locked or for doors that only need to be opened from one side. As an example, the door handle assembly may be suited for hall closet doors commonly found in residences. A hall closet door

provides access to a relatively small area, which is usually a storage area designated for storing coats and jackets. A hall closet door usually does not lock, and it usually has only one door handle.

[106] Door 260 has a storage side 262, which preferably faces the storage area and a user side 264 opposite the storage area. The door handle assembly has at least a faceplate 266 attached to user side 264. A faceplate cap 268 with an attached handle 270 is preferably attached to faceplate 266. An actuator 272 is attached to handle 270. Actuator 272 and handle 270 are mounted to and may pivot around an actuator mount (not shown in figure 19). A portion of actuator 272 is positioned inside an actuator passage (not shown in figure 19) of bolt 274.

[107] Biasing devices 282 and 284 urges bolt 274 to move inside a wall aperture 280 thereby closing door 260. To open door 260, actuator 272 may be actuated to move bolt 274 away from wall aperture 280 thereby releasing door 260 from wall aperture 280.

[108] PASSAGE DOOR ASSEMBLIES

[109] Referring now to figure 20, another embodiment of the door handle assembly is shown. The door handle assembly shown in figure 20 may be suited for doors that need not be locked and for doors that mainly partition rooms. Additionally, as hall closet doors for people with children, the door handle assembly shown in figure 20 may be preferred over the door handle assembly of figure 19 because the door handle assembly of figure 20 allows the children to open the door from the inside of the closet, and thus eliminates the risk of children being locked inside the hall closet. The door handle assembly shown in figure 20 preferably primarily provides passage between rooms, and thus may be opened by using the door handles positioned on both sides of the door.

[110] The door assembly of the embodiment shown in figure 20 preferably has opposing faceplates 290 and 292 attached on each side of door 288, faceplate caps 294 and 296 attached to each opposing faceplates 290 and 292, actuator mounts (not shown in figure 20) attached to each opposing faceplates 290 and 292, and door handles 298 and 300 with corresponding actuators 302 and 304 connected to actuator mounts. Additionally, the door assembly of the embodiment shown in figure 20 preferably has biasing devices 306 and 308, bolt 310, bolt collar 312, and bolt plate (not shown in figure 20).

[111] LOCKABLE DOOR ASSEMBLIES

[112] Figures 21-23 show additional door handle assembly embodiments. These door handle assembly embodiments may be suited for doors that are desired to be lockable for privacy or security purposes.

[113] Referring now to figure 21, the door handle assembly preferably has the same components as the embodiment shown in figure 19. Additionally, the door handle assembly of figure 21 has a cam 314 described in figures 17 and 18 above. A cam latch 316 may be positioned on one end of cam 314, preferably on the end of cam 314 that is facing a private or secured side 318 of door 320. Side 318 is preferably the side a user desires to prevent or limit access to for privacy or security reasons. Opposite to side 318, cam 314 has an alternate cam access 322 similar to alternate cam access 244 described in figures 17 and 18. Alternate cam access 322 may be used to as an alternate access for unlocking door 320.

[114] Referring now to figure 22, the door handle assembly preferably has similar components described in figure 21. The door handle assembly embodiment of figure 22 preferably does not have an alternate cam access of figure 22. Additionally, bolt 324 may have a greater length than the bolt described in figure 13.

[115] Referring now to figure 23, the door handle assembly preferably has similar components described in figure 21. The door handle assembly embodiment of figure 23 preferably has an alternate cam access 326 similar to alternate cam access 244 described in figures 17 and 18. An alternate faceplate cap 328 preferably covers alternate cam access 326. Alternate faceplate cap 328 is preferably cylindrical and has a key recess 330 spanning across its vertical axis. A key 332 may be used to actuate cam 314 to lock and unlock bolt 274. Alternate faceplate cap 328 may be made of zinc, brass, or other materials known in the art.

[116] Referring now to figure 24, a preferred embodiment of a door handle assembly has a faceplate 342 attached to a door 340. A faceplate cap 346 is attached to faceplate 342. Faceplate cap 346 has a vertical portion 348 and a horizontal portion 350. Horizontal portion 350 and door handle 352 defines a substantially flat surface 354. Horizontal portion 350 and door handle 352 are further substantially flush, which means horizontal portion 350 and door handle 352 form a substantially continuous plane or substantially unbroken surface except for a boundary 356 between horizontal portion 350 and door handle 352. Door handle assembly may further have a cam latch 358 behind door handle 352.

[117] Door 340 may be opened by pulling handle 352. Handle 352 may be moved around a pivot axis on a horizontal plane. As handle 352 moves around pivot axis, actuator (not shown in figure 24) engages bolt 360 and causes bolt 360 to slide within in its sliding axis. Sliding axis of bolt 360 is preferably parallel to the horizontal plane defined by the pivot axis.

[118] Referring now to figure 25, the preferred embodiment of door handle assembly 20 is shown with conventional door handle assemblies 380 and 382. The height of door handle assembly 20 as measured from door 386 is preferably less than the heights of conventional door handle assemblies 380 and 382. Additionally, angle 384 measured from the surface of door 386

to the front surface of door handle assembly 20 is preferably less than those of conventional door handle assemblies 380 and 382.

[119] It can thus be appreciated that certain embodiments of the present invention provide a door handle assembly having a low-profile characteristic. When the door handle assembly of the preferred embodiments shown in figure 24 and 25 is attached to a door and the door is moved toward a wall, the door handle assembly has little or no tendency to contact the wall. Therefore, the door handle assembly of the preferred embodiment minimizes wall damage.

[120] Certain embodiments of the present invention further provide non-rotational actuation feature of the door handle. As shown from the preferred embodiments in figure 24 and 25, the door handle assembly may require a pulling motion. For elderly, physically challenged, persons with wrist problems, and persons carrying objects on both hands, opening a door by a pulling motion may be easier than the conventional rotating motion.

[121] PUSH OPERATED DOOR HANDLE

[122] Previously described embodiments have described a door handle that is operated by a pulling motion, no matter which direction the door swings when opened. However, it may be beneficial to provide door handle assemblies where the motion used to actuate the door handle also serves to open the door. For example, a pulling motion may be most useful to operate a door handle when a door will swing inward, towards a person opening the door. A pushing motion may be used to operate a door handle when a door is to swing outward, away from a person opening a door. In this way, opening the door requires less force and operates in a more fluid manner. Such an embodiment may be especially useful for the disabled or for those who are not able to apply large amounts of force to operate a door handle and open a door.

[123] One suitable embodiment 400, that may be used with previously described components, is shown in figure 26. Door handle apparatus 400 may comprise a handle 404 having a

projection 410 adapated to be secured to a mount 416. Mount 416 is shown as a yoke or fork, however other mounts may be used. In certain embodiments, projection 410 extends between parallel projections 418 (only one of which is visible in figure 26) of mount 416 and may secured to mount 416 by any suitable means, such as by inserting a pin 418 or other suitable fastener apertures, such as pin openings 420 and 422 in parallel projections 418 and handle 404, respectively.

[124] An actuator 430, such as the tab leg shown in figure 26, may also be attached to mount 416. Actuator 430 may be coupled to mount 416 by any suitable means, such as by inserting a pin 436 or other suitable fastener through apertures, such as pin openings 440 and 442 in parallel projections 418 and actuator 430, respectively. Mount 416 may be integrally formed on a faceplate 448 or may be coupled to faceplate 448 by any suitable means, such as by welding or adhesives.

[125] Projection 410 of door handle 404 may also have a roller or linkage 454 coupled thereto. Roller 454 may be a ball bearing, a bicycle chain roller, a metal roller, or a roller constructed of other materials, including rubbers, plastics, and the like. In certain embodiments, such as the one depicted in figure 26, roller 454 may rotate about a vertical axis. Roller 454 may rest against a curved surface 460 of actuator 430. Roller 454 may be attached to, and rotate around, a pin 462 of handle 404. Of course, roller 454 may be attached to door handle 404 in other ways without departing from the scope of the present invention.

[126] When the door handle assembly 400 is not being actuated, roller 454 may rest at a first position 464 on actuator 430. When handle 404 is pushed, roller 454 will travel along surface 460 of actuator 430, eventually reaching a second position 466, shown in figure 27. Referring back to figure 26, during operation, force will be transmitted from handle 404, through roller

454, to actuator 430. As roller 454 moves, the transmitted force will cause force to be applied to actuator 430 in different directions, causing actuator 430 to move.

[127] In the embodiment shown in figure 26, a projection 470 of actuator 430 passes through an actuator opening 474 formed in a bolt 476. As roller 454 moves from first position 464 to second position 466, projection 470 of actuator 430 will engage a portion of the interior of bolt 476 towards the interior of a door (not shown in figure 26), causing bolt 470 to be retracted away from a wall aperture in a wall (not shown in figure 26).

[128] As described in previous embodiments, and as shown in figures 2 and 19-23, bolt 470 may be biased towards the wall aperture by or more biasing devices (such as biasing devices 82 and 78 of figure 2). When force is no longer applied to door handle 404, the biasing devices will cause bolt 470 to be biased towards the wall aperture, in turn causing roller 454 to move from second position 466 back to first position 464.

[129] The components of door handle assembly 400 may be used with any previously described door handle assemblies, or with other door handle assemblies now existing or later developed, that are within the skill of the art worker. In certain embodiments, a door handle assembly is provided which contains a push handle on one side and a pull handle on the other side.

[130] Conclusion

[131] Although the description above contains many specifications, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the presently preferred embodiments of this invention. Thus, the scope of the invention should be determined by the appended claims and their legal equivalents rather than by the examples given.